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BIOLOGICAL BULLETIN

THE MARINE BIOLOGICAL LABORATORY

SEVENTEENTH REPORT

FOR THE YEAR 1914

I. TRUSTEES

EX OFFICIO

FRANK R. LILLIE, *Director*, The University of Chicago.

GILMAN A. DREW, *Assistant Director*, Marine Biological Laboratory.

D. BLAKELY HOAR, *Treasurer*, 161 Devonshire Street, Boston, Mass.

GARY N. CALKINS, *Clerk of the Corporation*, Columbia University.

TO SERVE UNTIL 1918

CORNELIA M. CLAPP..... Mount Holyoke College.

E. G. CONKLIN..... Princeton University.

ROSS G. HARRISON..... Yale University.

CAMILLUS G. KIDDER..... 27 William Street, New York City..

M. M. METCALF..... Oberlin College.

WILLIAM PATTEN..... Dartmouth College.

JACOB REIGHARD..... University of Michigan.

W. B. SCOTT..... Princeton University.

TO SERVE UNTIL 1917

S. F. CLARKE..... Williams College.

CHARLES A. COOLIDGE..... Ames Building, Boston, Mass.

C. R. CRANE..... Woods Hole, Mass., President of the

Board.

ALFRED G. MAYER..... Carnegie Institution.

C. E. MCCLUNG..... University of Pennsylvania.

T. H. MORGAN..... Columbia University.

ERWIN F. SMITH United States Department of Agriculture.
E. B. WILSON Columbia University.

TO SERVE UNTIL 1916

H. H. DONALDSON Wistar Institute of Anatomy and Biology.
M. J. GREENMAN Wistar Institute of Anatomy and Biology.
C. W. HARGITT Syracuse University.
H. S. JENNINGS Johns Hopkins University.
GEORGE LEFEVRE University of Missouri, Secretary of the
Board.
A. P. MATHEWS University of Chicago.
G. H. PARKER Harvard University.
HENRY B. WARD University of Illinois.

TO SERVE UNTIL 1915

H. C. BUMPUS Tufts College.
R. A. HARPER Columbia University.
W. A. LOCY Northwestern University.
JACQUES LOEB The Rockefeller Institute for Medical
Research.
F. P. MALL Johns Hopkins University.
GEORGE T. MOORE Missouri Botanical Garden, St. Louis.
L. L. NUNN Telluride, Colo.
JOHN C. PHILLIPS 299 Berkeley Street, Boston, Mass.

II. ACT OF INCORPORATION

No. 3170.

COMMONWEALTH OF MASSACHUSETTS

Be It Known, That whereas Alpheus Hyatt, William Sanford Stevens, William T. Sedgwick, Edward G. Gardiner, Susan Minns, Charles Sedgwick Minot, Samuel Wells, William G. Farlow, Anna D. Phillips and B. H. Van Vleck have associated themselves with the intention of forming a Corporation under the name of the Marine Biological Laboratory, for the purpose of establishing and maintaining a laboratory or station for scientific study and investigation, and a school for instruction in biology and natural history, and have com-

plied with the provisions of the statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer, and Trustees of said Corporation, duly approved by the Commissioner of Corporations, and recorded in this office;

Now, therefore, I, HENRY B. PIERCE, Secretary of the Commonwealth of Massachusetts, *do hereby certify* that said A. Hyatt, W. S. Stevens, W. T. Sedgwick, E. G. Gardiner, S. Minns, C. S. Minot, S. Wells, W. G. Farlow, A. D. Phillips, and B. H. Van Vleck, their associates and successors, are legally organized and established as, and are hereby made, an existing Corporation, under the name of the MARINE BIOLOGICAL LABORATORY, with the powers, rights, and privileges, and subject to the limitations, duties, and restrictions, which by law appertain thereto.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed, this twentieth day of March, in the year of our LORD ONE THOUSAND, EIGHT HUNDRED and EIGHTY-EIGHT.

HENRY B. PIERCE,

Secretary of the Commonwealth.

[SEAL.]

III. BY-LAWS OF THE CORPORATION OF THE MARINE BIOLOGICAL LABORATORY

I. The annual meeting of the members shall be held on the second Tuesday in August, at the Laboratory, in Woods Hole, Mass., at 12 o'clock noon, in each year, and at such meeting the members shall choose by ballot a Treasurer and a Clerk, who shall be, *ex officio*, members of the Board of Trustees, and Trustees as hereinafter provided. At the annual meeting to be held in 1897, not more than twenty-four Trustees shall be chosen, who shall be divided into four classes, to serve one, two, three, and four years, respectively, and thereafter not more than eight Trustees shall be chosen annually for the term of four years. These officers shall hold their respective offices until others are chosen and qualified in their stead. The Director and Assistant Director, who shall be chosen by the Trustees, shall also be Trustees, *ex officio*.

II. Special meetings of the members may be called by the Trustees, to be held in Boston or in Woods Hole at such time and place as may be designated.

III. The Clerk shall give notice of meetings of the members by

publication in some daily newspaper published in Boston at least fifteen days before such meeting, and in case of a special meeting the notice shall state the purpose for which it is called.

IV. Twenty-five members shall constitute a quorum at any meeting.

V. The Trustees shall have the control and management of the affairs of the Corporation; they shall present a report of its condition at every annual meeting; they shall elect one of their number President and may choose such other officers and agents as they may think best; they may fix the compensation and define the duties of all the officers and agents; and may remove them, or any of them, except those chosen by the members, at any time; they may fill vacancies occurring in any manner in their own number or in any of the offices. They shall from time to time elect members to the Corporation upon such terms and conditions as they may think best.

VI. Meetings of the Trustees shall be called by the President, or by any two Trustees, and the Secretary shall give notice thereof by written or printed notice sent to each Trustee by mail, postpaid. Seven Trustees shall constitute a quorum for the transaction of business. The Board of Trustees shall have power to choose an Executive Committee from their own number, and to delegate to such Committee such of their own powers as they may deem expedient.

VII. The President shall annually appoint two Trustees, who shall constitute a committee on finance, to examine from time to time the books and accounts of the Treasurer, and to audit his accounts at the close of the year. No investments of the funds of the Corporation shall be made by the Treasurer except approved by the finance committee in writing.

VIII. The consent of every Trustee shall be necessary to dissolution of the Marine Biological Laboratory. In case of dissolution, the property shall be given to the Boston Society of Natural History, or some similar public institution, on such terms as may then be agreed upon.

IX. These By-Laws may be altered at any meeting of the Trustees, provided that the notice of such meeting shall state that an alteration of the By-Laws will be acted upon.

X. Any member in good standing may vote at any meeting, either in person or by proxy duly executed.

IV. TREASURER'S REPORT

CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDING
DECEMBER 31, 1914

RECEIPTS

Cash on hand January 1, 1914.....	\$ 4,663.05	
Annual dues.....	1,024.00	
BIOLOGICAL BULLETIN.....	1,221.12	
Dexter House.....	4,151.18	
Charles R. Crane.....	34,200.00	
Donations.....	35.14	
Dormitory, stone building.....	424.60	
Dormitory, Whitman Cottage.....	252.75	
Fish Trap.....	995.24	
Instruction, botany.....	750.00	
Instruction, embryology.....	1,000.00	
Instruction, physiology.....	500.00	
Instruction, zoology.....	2,100.00	
Mess.....	12,749.22	
Miscellaneous.....	620.15	
Research.....	2,950.00	
Supply department.....	<u>14,003.35</u>	\$81,639.80

PAYMENTS

Administration.....	\$ 7,202.56
BIOLOGICAL BULLETIN.....	1,771.64
Boats.....	5,604.42
Carpenter shop.....	288.27
Chemical department.....	2,640.20
Dexter House.....	4,104.87
Dormitory, stone building.....	204.06
Dormitory, Whitman House.....	148.37
Dredge.....	1,751.00
Fish Trap.....	1,206.41
Instruction, botany.....	950.00
Instruction, embryology.....	475.00
Instruction, physiology.....	650.00

Instruction, zoölogy	1,139.00	
Lectures	18.85	
Library	3,000.88	
Maintenance of buildings and grounds . . .	4,573.61	
Mess	17,665.68	
Miscellaneous	1,569.59	
New laboratory (furniture and equipment)	10,263.10	
Philosophical lectures	100.00	
Pumping station	3,892.38	
Supply department	10,295.75	
Supply department improvements	437.48	
Cash on hand January 1, 1915	<u>1,686.68</u>	\$81,639.80

CASH RECEIPTS AND DISBURSEMENTS ON ACCOUNT OF FUNDS,
AUGUST 1, 1914 TO JANUARY 1, 1915

RESERVE FUND

Cash on hand August 1, 1914	\$107.77	
Div. 14 shs. United Shoe Mach. Corp. Pfd. . .	5.25	
Div. 6 shs. Am. Smelting & Refining Co. Pfd. .	21.00	
Div. 8 shs. Gen. Elec. Co.	16.00	
Interest on deposit	<u>.28</u>	\$150.30

LUCRETIA CROCKER FUND

Cash on hand August 1, 1914	\$136.29	
Div. 1 sh. West End St. Ry. Co.	1.75	
Div. 18 shs. Vermont & Mass. Ry. Co.	54.00	
Div. 2½ shs. Gen. Elec. Co.	5.00	
Div. 1 sh. Am. Tel. & Tel. Co.	<u>2.00</u>	
	\$199.04	
1914 scholarship	<u>100.00</u>	99.04

LIBRARY FUND

Cash on hand August 1, 1914	\$157.79	
Div. 5 shs. United Shoe Mach. Corp. Pfd. . .	1.87	
Div. 1 sh. Am. Smelting & Refining Co. Pfd. .	3.50	
Div. 3 shs. Am. Tel. & Tel. Co.	6.00	
Div. 2½ shs. Gen. Elec. Co.	<u>5.00</u>	174.16
Cash on hand January 1, 1915		<u>\$423.50</u>

HARVEY S. CHASE AND COMPANY
 Certified Public Accountants
 84 State Street
 Boston

December 18, 1914.

D. BLAKELY HOAR, ESQ.,
 Treasurer, Marine Biological
 Laboratory at Woods Hole, Mass.,
 161 Devonshire Street, Boston.

Dear Sir: We have audited the accounts of the Marine Biological Laboratory as kept at Woods Hole, and of the Trust Funds and accounts as kept at your office, 161 Devonshire Street, for the year ended December 31, 1913.

We have checked the report of the Treasurer, submitted to us, and find it correct and in accordance with the books and accounts of the Laboratory. The extent of the audit is set forth in a detailed report under date of November 25, 1914.

Very respectfully,
 HARVEY S. CHASE & Co.

COST OF THE NEW LABORATORY, BY CONTRACT, PAID DIRECTLY FROM
 MR. CRANE'S OFFICE

L. D. Willcut Sons Co., Builders.....	\$77,810.32
C. E. Cronin, Plumbing.....	9,482.52
Edwin Lewis, Electrician.....	3,479.00
Cleghorn Heating Co., Heating.....	3,132.55
Otis Elevator Co., Elevator.....	1,485.00
Simpson Bros., Sinks.....	360.00
Monroe Refrigerator Co.....	195.00
Architect's Commission.....	4,842.61

\$100,787.00

V. LIBRARIAN'S REPORT

AUGUST, 1914

All who have worked in Woods Hole for any length of time must appreciate how grateful we are to have the library so well cared for, now, in the new fireproof building. It is certainly a great relief to fear no longer its sudden destruction. In addition

to this, the librarian may here announce the appointment of an assistant librarian to be in charge at the Laboratory throughout the year. This has been a pressing need for several years. It assures continuity of the work and has made possible many important improvements. We were fortunate to secure for this position Miss May E. Scott, who started work in April, after some weeks devoted to special training. In the meantime Dr. Drew supervised the moving and installation of the books in the new library.

The improvements noted below have been accomplished through Miss Scott's skillful management and very great industry. Unfortunately she has been ill since the middle of June, but her work was already so well in hand that it has been possible to continue most of it during this season. We must thank Miss Elizabeth Dunn for her valuable services in this emergency during the summer. Without her generous efforts in behalf of Miss Scott and the library we should have been seriously embarrassed. In addition to this we have been much helped by having extra assistance for two hours a day for the heavy summer routine.

The entire library has been re-accessioned, and new catalogs made. There are over 3,300 volumes exclusive of the reprints, which number over 1,500. A modern system has been introduced throughout, which will make the library much more accessible next year. Many missing parts were secured; and more than 500 volumes were bound, necessitating an extra expenditure of \$500. Several notable additions have been made to the library:

The American Museum of Natural History has loaned us indefinitely a number of their duplicate sets and books which will be of great assistance. These works are not yet catalogued, but there will be over 2,500 volumes, among which is a number of useful sets of journals, and of memoirs, transactions, and proceedings, of academies, etc., hitherto not on our shelves.

The Journal of Biological Chemistry was added, the back volumes being a gift from the editors.

Dr. Beyer presented several boxes of books containing among other things a duplicate set of the *American Journal of Physiology*,

and a set of the *Journal of Medical Research*; also *Zeitschrift für Hygiene*, and the *Archiv für Schiffs- und Tropenhygiene*.

Dr. Kellicott gave, in addition to his own text-books, about 100 volumes.

Dr. Otto Glaser sent a set of the *Proceedings of the Society of Experimental Biology and Medicine*, with other volumes.

Dr. Duggar has obtained a lot of much needed pamphlets missing from sets.

Mrs. Edward Gardiner added a number of volumes to her former gift.

Drs. Loeb, Minot, Hegner, McFarland, and Mrs. Agassiz and Mr. Crane presented books recently published.

The book-publishing companies have continued to present new books, Blakiston forwarding this week 14 volumes on chemistry, etc.

Stechert has inaugurated a new plan of sending books recently issued for examination. This was done at Dr. Oliver Strong's request, and has proved to be a great convenience.

Dr. H. F. Osborn gave a volume, and has turned over to us the premium on sales of one of his books. This will be continued.

Dr. E. E. Just has offered \$5.00 for five years to assist us in securing more journals. Dr. Rice has promised \$10 per year for the same purpose; Dr. E. B. Meigs gave \$10.00 also, and the amount already on hand, announced last year for this fund, now totals \$50.00, which will be expended for certain missing volumes of our files. We have acknowledged a number of reprints and books, but feel that here is a place where biologists may help us still more. A word to others and to publishers may greatly aid us.

The library has now reached a stage of stability. It is well housed, well cared for, of great use, and rapidly growing. We should be spending at least twice the present amount (that is about \$1,000 a year more for books); especially for a number of journals, now much in demand. There should be a few more works of general character. Members of the corporation might greatly extend the library with a little effort. The exchange list might be further extended as soon as conditions become quiet abroad.

There is little to be added to the material equipment; beyond a truck with shelves for shifting volumes, and some suitable arrangement, possibly glass gallery platforms, to make the upper shelves readily accessible.

H. McE. KNOWER,
Librarian.

Aug. 11, 1914.

VI. THE DIRECTOR'S REPORT

TO THE TRUSTEES OF THE MARINE BIOLOGICAL LABORATORY:

Gentlemen: I have the honor to transmit herewith a report of the twenty-seventh session of the Marine Biological Laboratory, for the year 1914. The number of investigators in attendance was 128, as compared with 122 in 1913, 93 in 1912, and 82 in 1911. The number of students in the courses was 89 as compared with 69 in 1913, 67 in 1912, and 65 in 1911. The total attendance was 217 as compared with 191 in 1913, 160 in 1912, and 147 in 1911. The number of subscribing institutions was 40 in 1914, as compared with 30 in 1913, 29 in 1912, 25 in 1911, 24 in 1910, 20 in 1909, 18 in 1908, and 16 in 1907. The list is given on p. 356. Amherst College, Beloit College, Johns Hopkins University, Rutgers College, and the University of Wisconsin, are among the new subscribing institutions. The total membership of the Corporation is now 327 as against 303 in 1913. The receipts from subscribing institutions and students' fees were \$7,300.00 as compared with \$6,160.00 in 1913, \$5,175.00 in 1912, \$4,574.99 in 1911, \$4,150.00 in 1910, and \$3,700.35 in 1909. The receipts from the supply department were \$14,003.35¹ in 1914, as compared with \$14,554.90 in 1913, \$13,966.35 in 1912, \$10,303.61 in 1911, \$9,300.58 in 1910 and \$8,549.55 in 1909.

The main event of the year was the occupation and dedication of the new permanent laboratory building, the gift of the president of the board of trustees, Mr. Crane. It has satisfied the pressing need of space for investigation which has been felt so keenly in the past two or three years; it has also provided improved facilities so greatly needed for certain types of research; and the new library room contained in it has enabled us to

¹ The business transacted in 1914 was actually \$1,100 more than in 1913, but collections were slow.

undertake a definite policy of library expansion. The building proved to be perfectly adapted for the purposes for which it was erected.

The exercises in dedication of the new building held on July 10 were attended by representatives of universities, members of the staff, the investigators and students working at the Laboratory, and by many friends. The buildings were open to inspection in the morning, and demonstrations of sea-animals and of research in progress were made, and the laboratory steamer made a collecting trip. Lunch was served to the invited guests. The formal exercises were held at 2 P.M., in a tent erected for the occasion, with an attendance of about 800. The addresses were interspersed with music by the Russian Balalaika Orchestra.

Mr. C. R. Crane, president of the Board of Trustees, and donor of the building presided. In opening the exercises, he said:

"I think we have come here particularly to celebrate the wonderful spirit that is back of the Woods Hole Biological Laboratory. It is very difficult to define that spirit, but I think we all know something of it and something is also known all through the scientific world. Without that spirit no amount of bricks and mortar and organization would be of any great service, but with that spirit the laboratory has been able to accomplish a very great deal with very simple means.

"For some time back it has seemed to be worth while to give this spirit a more substantial body. This spirit, as I see it, is very much like the spirit that President Wilson speaks so much of, the spirit of freedom and of coöperation, the fundamental spirit of democracy. In giving this spirit a more substantial body, we have been very fortunate in having with us Dr. Drew. I think we are all very happy at the wonderful result of his year's work. There is a rumor in circulation around here that Dr. Drew is a zoölogist. I believe that rumor has spread into the outside world, but I am very certain that we must all feel, after looking over the new laboratory, that Dr. Drew would have made his reputation as an engineer if he had a chance."

Short speeches were made by the Director, by Professor Conklin, and by the head of the U. S. Bureau of Fisheries, the Hon. Hugh M. Smith. Dr. R. M. Woodward, the Director of

the Carnegie Institution of Washington, then delivered the main address on the Needs of Research. These addresses were published in full in *Science*.¹

Extra provision was made this summer for the expected large attendance, by the lease of the Dexter House, which was run by the laboratory, and was made to pay expenses, including rent. With this increase the mess was able to accommodate the students and investigators comfortably. The Dexter House is in bad repair, and no lasting arrangement with the owner seems possible. We have therefore been casting about for other arrangements. The "Homestead" used for the help of the mess has long been overcrowded, and for some time we have regarded it as unsafe. Mr. Crane therefore offered to build on the homestead site a new dwelling house with accommodations for about forty people, which will be 10 to 12 in excess of the number employed in the Mess, and will therefore furnish some available space for women of the laboratory. This work is already nearly finished. Mr. Crane has also presented this autumn (1914) funds for improvement of the Cayadetta and for other purposes including the completion of the stone wall on the Yacht Club frontage and filling in behind it. This work is far advanced; when it is finished the building will be moved from in front of the new laboratory to the east end of the lot.

We shall thus begin the new year with most of our material needs satisfied to an extent that will probably be adequate for several years. The estimate of running expenses for 1915 shows a deficit of \$20,000 above receipts, as in 1914. Mr. Crane has again most generously promised his support to this extent. This brings up again the need of an endowment, which I think we should keep constantly before us until attained. The flourishing condition of the Laboratory constitutes a strong argument for its endowment; the Laboratory represents no new experiment, but a demonstrated success, and the fulfilment of one of the greatest needs of American biology. The coöperation of forty American universities and the attendance of representatives of thirty-seven more proves that we are supplying a want that is felt by all the institutions of higher learning. The

¹ Vol. XL., No. 1024, pp. 217-232.

attendance of the largest body of scientific investigators ever gathered for work at one place and time also proves the magnitude of the want that we supply. Not only so but it demonstrates the great influence over the progress of research which the Marine Biological Laboratory exerts. We can feel justified in using all the means in our power to secure the funds that will place this great organization beyond the stress of ordinary vicissitudes.

Provision has been made for continuation of the students' courses as in 1914, with one exception. Dr. Drew has felt for some years that the burden of executive work during the summer is so great that it is undesirable for him longer to retain charge of the course in embryology. The directors have therefore requested Professor Wm. E. Kellicott, who has been associated with Dr. Drew in this course for several years, to assume charge of it. He has consented, and we may feel confident that he will maintain its best traditions. We must all feel nevertheless a sense of loss in the relinquishment by Dr. Drew of this important course. For many years in charge of the course in invertebrate zoölogy, and then of the course in embryology, Dr. Drew has impressed the lessons of our science on students to an extent which few teachers can equal. I am sure that all will join in congratulating Dr. Drew on his great success as a teacher, and in the hope that the future will yield him more leisure again to resume this cherished part of a scientist's work.

There are submitted as parts of this report lists of the staff of 1914, investigators and students in attendance, subscribing institutions, evening lectures and of members of the corporation.

I. THE STAFF

1914

FRANK R. LILLIE, DIRECTOR,

Professor of Embryology, and Chairman of the Department of
Zoölogy, The University of Chicago.

GILMAN A. DREW, ASSISTANT DIRECTOR,

Marine Biological Laboratory.

ZOÖLOGY**I. INVESTIGATION**

- GARY N. CALKINS.....Professor of Protozoölogy, Columbia University.
- E. G. CONKLIN.....Professor of Zoölogy, Princeton University.
- GILMAN A. DREW.....Assistant Director, Marine Biological Laboratory.
- GEORGE LEFEVRE.....Professor of Zoölogy, The University of Missouri.
- FRANK R. LILLIE.....Professor of Embryology, The University of Chicago.
- C. E. MCCLUNG.....Professor of Zoölogy, University of Pennsylvania.
- T. H. MORGAN.....Professor of Experimental Zoölogy, Columbia University.
- E. B. WILSON.....Professor of Zoölogy, Columbia University.

II. INSTRUCTION

- CASWELL GRAVE.....Associate Professor of Zoölogy, Johns Hopkins University.
- W. C. ALLEE.....Instructor in Biology, Williams College.
- GEORGE A. BAITSELL.....Fellow in Zoölogy, Yale University.
- RAYMOND BINFORD.....Professor of Biology, Earlham College.
- E. J. LUND.....Bruce Fellow in Zoölogy, Johns Hopkins University.
- T. S. PAINTER.....Graduate Student, University of Würzburg.

EMBRYOLOGY**I. INVESTIGATION (See Zoölogy)****II. INSTRUCTION**

- GILMAN A. DREW.....Assistant Director, Marine Biological Laboratory.
- LORANDE L. WOODRUFF....Assistant Professor of Biology, Yale University.
- WILLIAM E. KELLICOTT....Professor of Biology, Goucher College.
- ROBERT A. BUDINGTON....Professor of Zoölogy, Oberlin College.

PHYSIOLOGY**I. INVESTIGATION**

- ALBERT P. MATHEWS.....Professor of Physiological Chemistry,
The University of Chicago.
- R. S. LILLIE.....Professor of Biology, Clark University.
- HAROLD C. BRADLEY.....Assistant Professor of Physiological
Chemistry, University of Wisconsin.

II. INSTRUCTION

- RALPH S. LILLIE.....Professor of Biology, Clark University.
- WALTER E. GARREY.....Associate Professor of Physiology, Wash-
ington University Medical School.
- FRANK P. KNOWLTON.....Professor of Physiology, Syracuse Uni-
versity.
- EDWARD B. MEIGS.....Associate in Physiology, Wistar Institute
of Anatomy and Biology.

PHILOSOPHICAL ASPECTS OF BIOLOGY AND ALLIED SCIENCES**LECTURES**

- EDWARD G. SPAULDING.....Assistant Professor of Philosophy, Prince-
ton University.

BOTANY

- GEORGE T. MOORE.....Director, Missouri Botanical Garden and
Professor of Botany, Washington Uni-
versity.
- GEORGE R. LYMAN.....Assistant Professor of Botany, Dart-
mouth College.
- B. M. DUGGAR.....Physiologist, Missouri Botanical Garden
and Professor of Plant Physiology,
Washington University.
- IVEY F. LEWIS.....Assistant Professor of Botany, University
of Wisconsin.
- W. J. ROBBINS.....Instructor in Plant Physiology, Cornell
University.
- A. R. DAVIS.....Lackland Research Fellow, Shaw School
of Botany.

LIBRARY

- H. MCE. KNOWER.....Professor of Anatomy, University of
Cincinnati, Librarian.
- MARY E. SCOTT.....Assistant Librarian.

CHEMICAL SUPPLIES

OLIVER S. STRONG.....Instructor in Anatomy, College of Physicians and Surgeons, New York City,
Chemist.

SUPPLY DEPARTMENT

G. M. GRAY.....Curator.
JOHN J. VEEDER.....Captain.
E. M. LEWIS.....Engineer.
O. F. CURTIS.....Collector and Assistant Curator of Botanical Supplies.
A. W. LEATHERS.....Collector.
A. M. HILTON.....Collector.
EDNA E. WELLS.....Clerk

F. M. MACNAUGHT.....Business Assistant.

2. INVESTIGATORS AND STUDENTS**INVESTIGATORS**

1914

ZOOLOGY**Independent Investigators**

ALLEE, W. C., Assistant Professor in Zoölogy, University of Oklahoma.
BAITSELL, GEORGE A., Instructor in Biology, Yale University.
BEGG, A. S., Instructor in Comparative Anatomy, Harvard Medical School.
BINFORD, RAYMOND, Professor of Zoölogy, Earlham College, Richmond, Ind.
BROWNE, ETHEL N., 510 Park Ave., Baltimore, Md.
BUDINGTON, ROBERT A., Professor of Zoölogy, Oberlin College.
CALKINS, GARY N., Professor of Protozoölogy, Columbia University.
CHIDESTER, FLOYD E., Assistant Professor of Zoölogy, Rutgers College.
CHILD, C. M., Associate Professor of Zoölogy, University of Chicago.
CLAPP, CORNELIA M., Professor of Zoölogy, Mount Holyoke College.
CLARK, ELIOT R., Professor of Anatomy, University of Missouri.
CLARK, ELEANOR L., Johns Hopkins Medical School.
COE, WESLEY R., Professor of Biology, Yale University.
CONKLIN, E. G., Professor of Biology, Princeton University.
COWDRY, EDMUND V., Associate in Anatomy, Johns Hopkins Medical School.
COWDRY, N. H., Johns Hopkins Medical School.
CRAMPTON, H. E., Professor of Zoölogy, Barnard College, Columbia Univ.

- DANCHAKOFF, WERA, Director of laboratory for medical research, Moscow, Russia.
- DOLLEY, DAVID H., Professor of Pathology, University of Missouri.
- DONALDSON, H. H., Wistar Institute of Anatomy and Biology.
- DREW, GILMAN A., Assistant Director, Marine Biological Laboratory.
- DUNN, ELIZABETH H., Woods Hole, Mass.
- ERDMANN, RHODA, Theresa Leesell Research Fellow, Yale University.
- GOLDFARB, A. J., Professor of Biology, College of the City of New York.
- GRAVE, CASWELL, Associate Professor of Zoölogy, Johns Hopkins University.
- HEGNER, ROBERT W., Assistant Professor of Zoölogy, University of Michigan.
- HOGUE, MARY J., Instructor in Zoölogy, Wellesley College.
- JACKSON, FREDERIC S., Lecturer in Histology and Embryology, McGill Univ.
- JORDAN, HARVEY E., Professor of Histology and Embryology, University of Virginia.
- KELLCOTT, W. E., Professor of Biology, Goucher College.
- KINGSBURY, FRANCIS B., Instructor, University of Minnesota.
- KNOWER, HENRY MCE., Professor of Anatomy, University of Cincinnati.
- KUNKEL, BEVERLY W., Professor of Zoölogy, Beloit College.
- LEFEVRE, GEORGE, Professor of Zoölogy, University of Missouri.
- LEWIS, MARGARET R., Johns Hopkins Medical School.
- LEWIS, WARREN H., Professor of Physiological Anatomy, Johns Hopkins Medical School.
- LILLIE, FRANK R., Professor of Embryology, University of Chicago.
- LOOMIS, FREDERIC B., Professor of Comparative Anatomy, Amherst College.
- LUND, E. J., Instructor in Protozoölogy, University of Pennsylvania.
- MACDOWELL, E. C., Instructor, Yale University.
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- MORGAN, T. H., Professor of Experimental Zoölogy, Columbia University.
- NEWMAN, H. H., Associate Professor of Zoölogy, University of Chicago.
- NOWLIN, NADINE, Assistant Professor of Zoölogy, University of Kansas.
- PAINTER, T. S., Instructor, Yale University.
- PATTERSON, J. T., Professor of Zoölogy, University of Texas.
- PEARL, RAYMOND, Biologist of Maine Agricultural Experiment Station.
- PEEBLES, FLORENCE, Lecturer, Bryn Mawr College.
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- SHOREY, MARIAN L., Professor of Biology, Milwaukee-Downer College.
- SPAULDING, E. G., Professor of Philosophy, Princeton University.
- STOCKARD, CHARLES R., Professor of Anatomy, Cornell Medical College.
- STRONG, O. S., Instructor in Anatomy, Columbia University.
- STRONG, R. M., Instructor in Zoölogy, University of Chicago.
- TENNENT, DAVID H., Professor of Biology, Bryn Mawr College.
- WIEMAN, H. L., Assistant Professor of Zoölogy, University of Cincinnati.
- WILDMAN, E. E., University of Pennsylvania.
- WILSON, E. B., Professor of Zoölogy, Columbia University.
- WOODRUFF, L. L., Assistant Professor of Biology, Yale University.
- ZELENY, CHARLES, Associate Professor of Zoölogy, University of Illinois.

Beginning Investigators

- ADKINS, W. S., Graduate Student, Columbia University.
ALLEN, EZRA, Professor of Biology at Philadelphia School of Pedagogy, University of Pennsylvania.
BRIDGES, CALVIN B., Fellow in Zoölogy, Columbia University.
BULLOCK, FREDERICK D., Instructor in Cancer Research, Columbia University.
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COBB, MARGARET V., University of Illinois.
DEXTER, JOHN S., Graduate Student, Columbia University.
FIELD, HAZEL E., Graduate Student, University of Chicago.
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GOULD, HARLEY N., Fellow in Biology, Princeton University.
GUNTHER, MAUDE C., Instructor in Biology, Eastern High School, Washington, D. C.
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HOY, WILLIAM E., JR., Fellow in Biology, Princeton University.
KEY, J. A., Student, Johns Hopkins Medical School.
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LEATHERS, A. L., Instructor in Zoölogy, Northwestern University.
MEDES, GRACE, Graduate Student, Bryn Mawr College.
METZ, CHAS. W., Carnegie Institution Staff, Cold Spring Harbor, L. I.
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PACKARD, CHARLES, Instructor in Zoölogy, Columbia University.
SHUMWAY, WALDO, Assistant in Zoölogy, Columbia University.
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STOCKING, RUTH J., Student, Johns Hopkins University.
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WOODWARD, ALVALYN E., Fellow in Zoölogy, University of Michigan.
YOCUM, H. B., Instructor in Zoölogy, Kansas State Agricultural College.
YOUNG, DONNELL B., Laboratory Assistant, Columbia University.

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- BRADLEY, H. C., Associate Professor of Physiological Chemistry, University of Wisconsin.
CHAMBERS, ROBERT, JR., Assistant Professor of Histology and Comparative Anatomy, University of Cincinnati.
GARREY, W. E., Associate Professor of Physiology, Washington University Medical School.
HARVEY, E. N., Instructor in Physiology, Princeton University.
HYDE, IDA H., Professor of Physiology, University of Kansas.
JUST, E. E., Professor of Physiology, Howard University.
KANDA, SAKYO, Research Assistant, University of Minnesota.
KITE, GEORGE D., Assistant in Physiology, Henry Phipps Institute.
KNOWLTON, FRANK P., Professor of Physiology, Syracuse University, College of Medicine.

LILLIE, R. S., Professor of Biology, Clark University.

LOEB, JACQUES, Head of Department of Experimental Biology, Rockefeller Institute for Medical Research.

MATHEWS, A. P., Professor of Physiological Chemistry, University of Chicago.

MATTILL, HENRY A., Professor of Physiological Chemistry, University of Utah.

MEIGS, EDWARD B., Fellow in Physiology, Wistar Institute of Anatomy and Biology.

MOORE, A. R., Associate Professor of Physiology, Bryn Mawr College.

OLIVER, WADE W., Student, Ohio-Miami Medical College.

TASHIRO, SHIRO, Instructor in Physiological Chemistry, University of Chicago.

UHLENHUTH, EDUARD, Rockefeller Institute for Medical Research.

WARREN, HOWARD C., Stuart Professor of Psychology, Princeton University.

WASTENEYS, HARDOLPH, Associate in Experimental Biology, Rockefeller Institute for Medical Research.

WERBER, ERNEST I., Instructor in Anatomy, Northwestern University.

WHERRY, W. B., Associate Professor of Bacteriology, University of Cincinnati.

Beginning Investigators

HYMAN, LIBBIE H., Laboratory Assistant in Zoölogy, University of Chicago.

BOTANY

Independent Investigators

BLAKESLEE, A. F., Professor of Botany and Genetics, Connecticut Agricultural College.

COLLEY, R. H., Instructor in Botany, Dartmouth College.

DAVIS, A. R., Lackland Research Fellow, Shaw School of Botany, Washington University.

DUGGAR, B. M., Physiologist in charge of Graduate Laboratory and Professor of Plant Physiology, Missouri Botanical Garden.

GATES, R. R., University of London, England.

LEWIS, I. F., Professor of Botany, University of Missouri.

LYMAN, GEORGE R., Assistant Professor of Botany, Dartmouth College.

MOORE, GEO. T., Director, Missouri Botanical Garden.

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Beginning Investigators

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STUDENTS

1914

ZOOLOGY

ALLEN, WILLIAM RAY, Assistant in Kansas State Agricultural College, Manhattan, Kans.

APPLEGATE, ANNE G., Student, Western College, Oxford, Ohio.

- APPLEGATE, ELEANOR, Western College, Oxford, Ohio.
ASHMAN, RICHARD, Student, Rutgers College, New Brunswick, N. J.
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GREENE, PHILLIPS F., Biology Laboratory Assistant, Amherst College.
GREENE, WALTER F., Amherst College.
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HAMILTON, FLORENCE N., Student, Vassar College.
JACKSON, FRANCES E., Student, Mt. Holyoke College.
JANNEY, MARION, Goucher College.
KELLOGG, EMILIE, Student, Mt. Holyoke College.
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RUSH, J. E., Assistant Professor, Wisconsin.
SCHMOLL, HAZEL M., Assistant in Biology, Vassar College.
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STRONGMAN, BESSIE T., Student, University of Colorado.
THOMAS, ANNA M., Student, Carnegie Institute of Technology.
TIESING, PAUL E., Student, Yale University.
WARREN, CATHERINE C., Princeton, N. J.
WAYMAN, MARGUERITE, Student, Hunter College, New York City.

EMBRYOLOGY

- ALLEN, CHARLES E., Assistant Instructor, Wabash College.
BALDWIN, FRANCIS M., Instructor in Biology, Western Maryland College.
BINKLEY, LELIA T., University of Texas.
CHAMBERLAIN, MARY M., Student, Bryn Mawr College.
DAVIS, CARL L., Professor of Anatomy, George Washington University, Washington, D. C.
DIEHL, JANE K., Student, Wellesley College.

GOVER, MARY, Goucher College, Baltimore, Md.
HESS, WALTER N., Instructor, Pennsylvania State College, State College.
HUNTER, OSCAR B., Professor of Histology and Embryology, Associate in Anatomy,
George Washington University, Washington, D. C.
MANN, MARY LEE, Barnard College.
McFARLAND, HELEN J., Student, Bryn Mawr College.
MILLS, FRANCES A., Barnard College.
NELSON, THURLOW C., Assistant in Zoölogy, University of Wisconsin.
OGDEN, WARNER, Student, Carleton College, Northfield, Minn.
PLOUGH, HAROLD H., Assistant in Zoölogy, Amherst College.
POTTER, BESS, Student, Doane College, Crete, Neb.
PREBLE, JESSIE L., Student, Bryn Mawr College.
TAFT, ANNIE E., Curator Dept. of Neuropathology, Harvard Medical School.
WALTON, ARTHUR C., Student Assistant, Northwestern University.
WARE, CLARA C., Graduate Student, Columbia University.
YOUNG, THOMAS O., Student, Carleton College, Northfield, Minn.

PHYSIOLOGY

ATWOOD, WARREN G., Student, Dartmouth College.
BENJAMIN, BLANCHE M., Student, Radcliffe College.
FREDERICK, NORA, Teacher in Biology, Lewis Institute, Chicago.
HYMAN, LIBBIE H., Laboratory Assistant in Zoölogy, University of Chicago.
LINTON, EDWIN S., Graduate Student, Washington and Jefferson College.
LYNCH, VERNON, Graduate Student, Johns Hopkins University.
OLIVER, SYMMES F., University of Michigan, Ann Arbor.
REDFIELD, ALFRED C., Assistant in Zoölogy, Harvard University.
VANNEMAN, AIMÉE S., Vassar College.
WALLING, LALIA V., Instructor in Physiology, University of Kansas.

BOTANY

ALLARD, ANNE D., Teacher in Boston Normal School, Boston.
BURKS, GEORGE PAUL, Student, Wabash College.
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GREEN, NEWTON B., Student, Oberlin College.
HERRICK, JOSEPH C., Professor of Biology, St. Joseph's Seminary, Yonkers, N. Y.
MALLARD, AGNES K., Teacher, Boston Normal School, Boston.
McLAUGHLIN, FREDERICK A., Instructor in Botany, Mass. Agricultural College.
SEVERY, J. WARREN, Student, Oberlin College.
STEARNS, FRANCES L., Teacher, Central High School, Grand Rapids, Mich.
WANN, F. B., Missouri Botanical Garden, St. Louis, Mo.
WILLEY, ALBERT G., Student, Dartmouth College.

3. TABULAR VIEW OF ATTENDANCE

	1911	1912	1913	1914
INVESTIGATORS—Total.....	82	93	122	128
Independent:				
Zoölogy.....	42	44	58	62
Physiology.....	18	14	17	22
Botany.....	8	10	11	10
Under Instruction:				
Zoölogy.....	12	21	21	31
Physiology.....	2	2	7	1
Botany.....		2	7	3
STUDENTS—Total.....	65	67	69	89
Zoölogy.....	26	24	33	43
Embryology.....	20	15	22	21
Physiology.....	6	11	8	10
Botany.....	13	17	7	15
TOTAL ATTENDANCE.....	147	160	191	217
INSTITUTIONS REPRESENTED—Total....		57	80	77
By investigators.....	37	43	50	51
By students.....	31	36	41	47
SCHOOLS AND ACADEMIES REPRESENTED				
By investigators.....	3	2	3	1
By students.....	9	1	6	5

4. SUBSCRIBING INSTITUTIONS

AMHERST COLLEGE.
 BARNARD COLLEGE.
 BELOIT COLLEGE.
 BRYN MAWR COLLEGE.
 CARLTON COLLEGE.
 COLUMBIA UNIVERSITY.
 CARNEGIE INSTITUTE OF TECHNOLOGY.
 DARTMOUTH COLLEGE.
 DOANE COLLEGE.
 GOUCHER COLLEGE.
 HARVARD UNIVERSITY.
 HARVARD MEDICAL SCHOOL.
 HUNTER COLLEGE, N. Y. C.

KANSAS STATE AGRICULTURAL COLLEGE.
 JOHNS HOPKINS UNIVERSITY.
 LUCRETIA CROCKER SCHOLARSHIPS.
 MCGILL UNIVERSITY.
 MOUNT HOLYOKE COLLEGE.
 NORTHWESTERN UNIVERSITY.
 OBERLIN COLLEGE.
 PRINCETON UNIVERSITY.
 RADCLIFFE COLLEGE.
 RHODE ISLAND STATE COLLEGE.
 ROCHESTER UNIVERSITY.
 ROCKEFELLER INST. FOR MED. RESEARCH.
 SMITH COLLEGE.
 RUTGERS COLLEGE.
 UNIVERSITY OF CHICAGO.
 UNIVERSITY OF CINCINNATI.
 UNIVERSITY OF ILLINOIS.
 UNIVERSITY OF KANSAS.
 UNIVERSITY OF MICHIGAN.
 UNIVERSITY OF PENNSYLVANIA.
 UNIVERSITY OF WISCONSIN.
 VASSAR COLLEGE.
 WELLESLEY COLLEGE.
 WESTERN COLLEGE.
 WISTAR INSTITUTE.
 WABASH COLLEGE.
 YALE UNIVERSITY.

5. EVENING LECTURES, 1914

Friday, July 3,

PROF. T. H. MORGAN....."Chromosomes and Mendelian Heredity."

Tuesday, July 7,

DR. ERWIN F. SMITH....."Crown Gall in Plants, with Reference to the Nature and Origin of Cancer."

Tuesday, July 14,

DR. G. L. KITE....."The Colloidal Structure of Living Matter as Determined by Microdissection."

Friday, July 17,

DR. LAWRENCE J. HENDERSON. "The Functions of the Environment."

Tuesday, July 21,

PROF. D. H. TENNENT. "Hybridization in Sea-urchins."

Friday, July 24,

PROF. H. C. WARREN. "Freedom of Teaching in American Colleges."

Tuesday, July 28,

DR. FRANK M. CHAPMAN. "An Ornithological Expedition to Colombia."

Friday, July 31,

DR. RAYMOND PEARL. "The Physiology of Reproduction in the Domestic Fowl."

Tuesday, Aug. 4,

DR. ALFRED G. MAYER. "The Coral Reefs of Torres Straits."

Friday, Aug. 7,

DR. EDWIN LINTON. "Reminiscences of the Woods Hole Laboratory of the U. S. Fish Commission, 1882-1889."

Friday, Aug. 14,

DR. R. R. GATES. "Recent Aspects of Mutation."

6. MEMBERS OF THE CORPORATION.

I. LIFE MEMBERS

ALLIS, MR. E. P., JR., Palais Carnoles, Menton, France.

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KIDDER, MR. NATHANIEL T., Milton, Mass.

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MEANS, MR. JAMES HOWARD, 196 Beacon St., Boston, Mass.

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MINNS, MISS SUSAN, 14 Louisburg Square, Boston, Mass.

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MORGAN, MRS. T. H., New York City, N. Y.

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NUNN, MR. LUCIAN L., Telluride, Colo.

OSBORN, PROF. HENRY F., American Museum of Natural History,
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PHILLIPS, MRS. JOHN C., Windy Knob, Newham, Mass.

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WILMARTH, MRS. H. D., Elliott St., Jamaica Plain, Mass.
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WILSON, DR. E. B., Columbia University, New York City, N. Y.
WILSON, PROF. W. P., Philadelphia Museum, Philadelphia, Pa.

2. MEMBERS, JANUARY, 1915

ABBOTT, PROF. J. F., Washington University, St. Louis, Mo.
ABBOTT, MISS MARGARET B., The Bennett School, Milbrook,
N. Y.
ADDISON, DR. W. H. F., University of Pennsylvania, Medical
School, Philadelphia, Pa.
ADKINS, MR. W. S., Texas Christian University, Fort Worth
Texas.
ALLEE, DR. W. C., University of Oklahoma, Norman, Okla.
ALLEN, PROF. EZRA, 413 Lancaster St., Ardmore, Pa.
ALLYN, MISS HARRIET M., Hackett Medical College, Canton,
China.
ALSBURG, DR. C. S., U. S. Dept. of Agriculture, Washington, D. C.
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BAKER, DR. E. H., 5436 University Ave., Chicago, Ill.
BANCROFT, PROF. F. W., Aloha Farm, Concord, California.
BARDEEN, PROF. C. R., University of Wisconsin, Madison, Wis.
BECKWITH, MISS CORA J., Vassar College, Poughkeepsie, N. Y.
BEHRE, MISS ELINOR H., Sophie Newcomb College, Tulane
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BEYER, DR. H. G., Stoneleigh Court, Washington, D. C.
BIGELOW, PROF. M. A., Teachers College, Columbia University,
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- BIGELOW, PROF. R. P., Mass. Institute of Technology, Boston, Mass.
- BINFORD, DR. RAYMOND, Earlham College, Richmond, Ind.
- BINKLEY, MISS LELIA T., University of Texas, Austin, Texas.
- BLAKESLEE, PROF. A. F., Connecticut Agricultural College, Storrs, Conn.
- BOX, MISS CORA MAY, University of Cincinnati, Cincinnati, Ohio.
- BRADLEY, DR. HAROLD C., University of Wisconsin, Madison, Wis.
- BROWNE, MISS ETHEL N., East Hall, Univ. of California, Berkeley, Cal.
- BUDINGTON, PROF. R. A., Oberlin College, Oberlin, Ohio.
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- CHESTER, PROF. WEBSTER, Colby College, Waterville, Me.
- CHIDESTER, DR. F. E., Rutgers College, New Brunswick, N. J.
- CHILD, PROF. C. M., University of Chicago, Chicago, Ill.
- CLAPP, PROF. CORNELIA M., Mount Holyoke College, South Hadley, Mass.
- CLARK, DR. E. R., University of Missouri, Columbia, Mo.
- COE, PROF. W. R., Yale University, New Haven, Conn.
- COLLEY, DR. R. H., Dartmouth College, Hanover, N. H.
- COLTON, PROF. H. S., Ardmore, Pa.
- COOLIDGE, MR. C. A., Ames Bldg., Boston, Mass.
- COPELAND, DR. MANTON, Bowdoin College, Brunswick, Maine.
- COWDRY, DR. E. V., Johns Hopkins Medical School, Baltimore, Md.

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DERICK, PROF. CARRIE M., McGill University, Montreal,
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DORRANCE, MISS FRANCES, Dorranceton, Pa.

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